VIII. *Some Remarks on Mr. Kunhi Kannan's Paper, "An Instance of Mutation."* By E. Ernest Green, F.Z.S.

[Read March 6th, 1918.]

The author records some extremely interesting observations on a marked degeneration (that has appeared within quite recent years) in the antennae of two nearly related *Coccidae*—*Lecanium* (*Coccus*) *viride* and *Pulvinaria psidii*.

In the year 1882 a green scale-insect attracted attention in Ceylon as a serious pest of the coffee plant, though it was not until 1886 that it was recognised and described as a new species under the name of *Lecanium viride*. The same species was found to be infesting the coffee plantations of Southern India a few years after its first appearance in Ceylon. It does not appear to have been noticed in the Mysore district until 1912, at which time the insect is said to have been quite typical in regard to the structure of the antennae. Mr. Kannan reproduces a photograph of "one of the first specimens sent in for identification at the outbreak of the pest," which exhibits seven-jointed antennae. Yet, by the following year (1913), the Mysore examples of the insect—though otherwise typical of the species—were found to have undergone a remarkable degeneration which took the form of a reduction of the number of antennal joints to 5, 4, and 3, instead of the normal number of 7. This (as may be gathered from the author's figures) was effected by a suppression of intermediate divisions until—in the final stage—there remained only the normal 1st and 2nd joints, with a long compound segment consisting of the other 5 joints with little or no trace of the former divisions. It is now said to be difficult to find a single example with antennae showing more than three visible segments. From a consideration of these facts the author arrives at the conclusion that a new species has been suddenly evolved, and he proceeds to describe it—under a new name—as *Coccus colemani*.

I have had no opportunity of examining examples of this insect, but presuming that it has been correctly identified and that it is really a sudden mutation from the original *Lecanium viride*, it still seems questionable if there is

sufficient justification for the erection of a new species. I should prefer to regard it as merely a local race or—at most—allow it to rank as a subspecies. But Mr. Kannan goes so far as to suggest the propriety of erecting a new subgenus for its reception!

Students of the *Coccidae* are beginning to realise that too much reliance has been placed upon antennal characters as a factor in classification. There is scarcely a single species that does not exhibit variability in one direction or another—in colour, size, or form, or in the structure of one or more of its organs; and it is in the antennae that variation is most liable to occur.

Mr. Kannan describes also what he considers to be two abnormal forms from Java, which he believes to have been similarly evolved from *L. viride*. From his description, one of these (the round, convex form) would appear to be a new species, while the other is probably identical with *L. africanum*—a species which the author believes to have been equally derived from *viride*. It would be interesting to know whether these Javan insects have been submitted to any expert opinion.

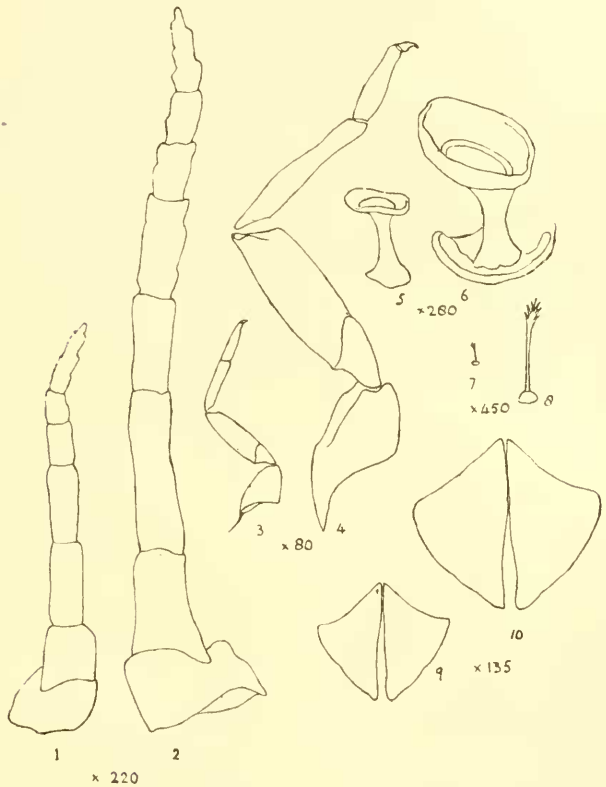
But the most important part of Mr. Kannan's paper is concerned with his hypothesis that *Lecanium viride* itself is a direct mutant from *Pulvinaria psidii*. From the title and sub-title of his paper, it may be judged that the author considers that he has fully proved his case. I must confess that his arguments—though most ingenious—are scarcely convincing, and appear (to me) to be founded upon insufficient evidence.

The main argument, when analysed, appears to be as follows:—

1. *Lecanium viride* has suddenly evolved a distinct variety with 3-jointed antennae.
2. There are allied species, subspecies, or races in Africa and Java.
3. *L. viride* "is therefore clearly unstable."
4. *Pulvinaria psidii* is subject to variation and has allied forms in other countries.
5. *L. viride* and *P. psidii* resemble each other superficially and occupy the same regions.
6. Therefore *L. viride* is a mutant of *P. psidii*. Q.E.D.

This, of course, is a very bald way of stating the case. Our author marshals a large array of evidence—or supposed

evidence—in support of his theory; but much of this is open to question. The first four clauses may be accepted



A comparison of various organs of *Lecanium viride* and *Pulv. psidii*. (The figures have been drawn to scale, with the aid of a camera lucida: each pair being amplified to the extent that best shows their relative proportions.)

Lecanium viride.	*Pulvinaria psidii.*
1, antenna, × 220.	2, antenna, × 220.
3, mid leg, × 80.	4, mid leg, × 80.
5, posterior spiracle, × 280.	6, posterior spiracle, × 280.
7, marginal hair, × 450.	8, marginal hair, × 450.
9, anal operculum, × 135.	10, anal operculum, × 135.

almost without comment, except that I may point out that the third does not necessarily follow upon the second,

With regard to clause five, I hold the opinion that the resemblance is superficial only. In his tabulated differences between *viride* and *psidii* the author pays no attention to dimensions, and there is nothing to indicate whether his figures are drawn to scale or not. Though the over-all measurements of the two insects fall within the same range of variation, this is by no means the case with respect to the size of the various organs and the proportionate lengths of the joints of the limbs. In spite of the fact that the two insects are of approximately the same size, it will be seen (*vide* accompanying text figures) that all the organs of *viride* are very much smaller than the corresponding structures of *psidii*. Taking these in order, we find that the length of the antenna of typical *viride* is to that of *psidii* in the proportion of 55 to 97. A still more striking contrast is seen in a comparison of the legs of the two species, which are in the proportion of 6 to 15 (femur 11 to 28, tibia 7 to 22, tarsus 5 to 11). The proportions of other organs show corresponding differences: anal operculum (length) as 8 to 11, (breadth) as 18 to 25; orifice of posterior spiracle, as 9 to 17; marginal hairs, as 2 to 13. The relative proportions of the joints of individual limbs also show strong points of difference: in *viride*, the femur is to the tibio-tarsal member as 11 to 12, and the tibia is to the tarsus as 7 to 5; while, in *psidii*, the same members are in the proportion of 28 to 33 and 22 to 11 respectively. Thus we find that, while in *viride* the tarsus and tibia are approximately equal in length, in *psidii* the tibia is twice as long as the tarsus. The relative lengths of these two joints are usually accepted as useful specific characters.

The fact that a reduction in the number of antennal joints has been observed in South Indian specimens of both *viride* and *psidii* does not, in my opinion, provide an argument in favour of the transmutation of the two species; but suggests, rather, that a similar environment has induced a tendency to variation in the same direction.

The author remarks that "the main distinction on which Green appears to rely is that *psidii* secretes meal and *viride* does not." I am sorry if any such opinion is to be gathered from my descriptions of the two species. I maintain that the similarity is purely superficial, and that an examination of the microscopic characters would make it impossible to confuse the two insects.

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MUTATION IN COCCIDAE.